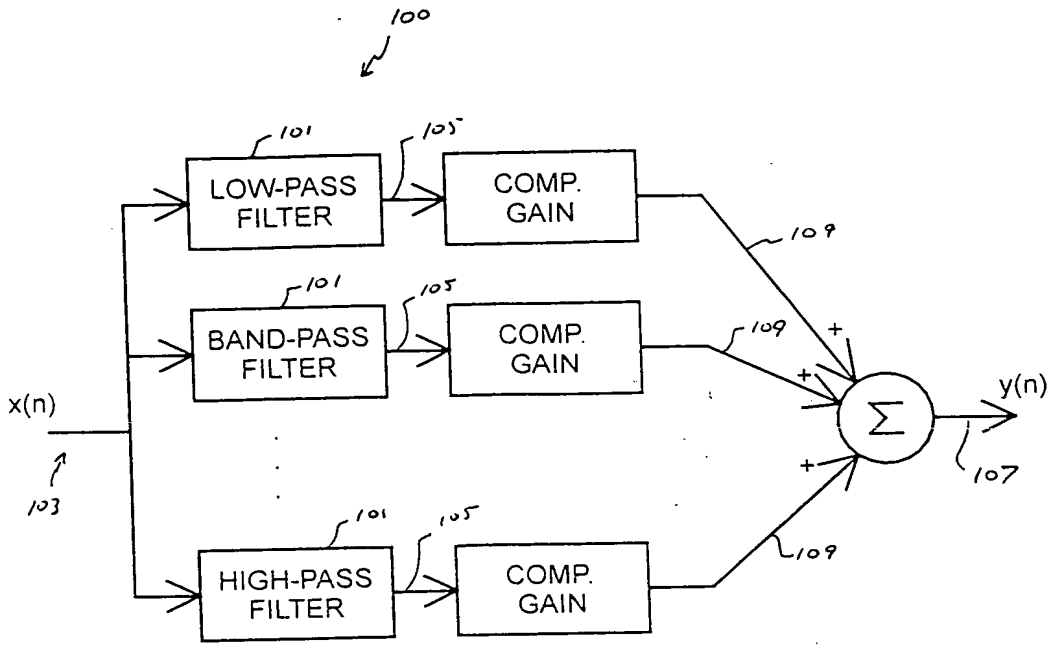


FIG. 1 PRIOR ART

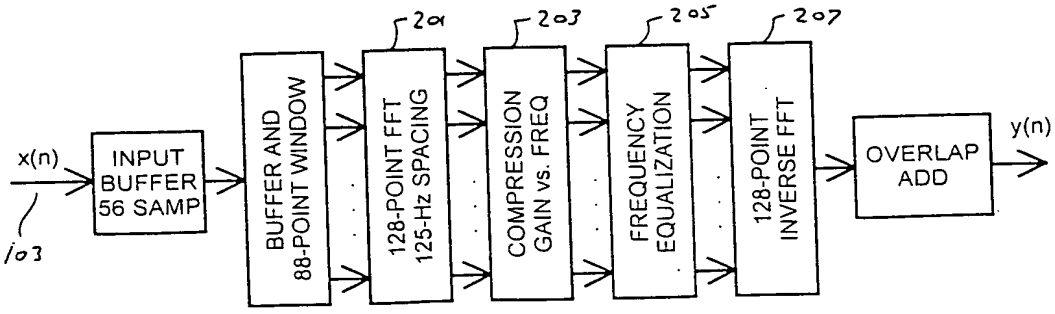
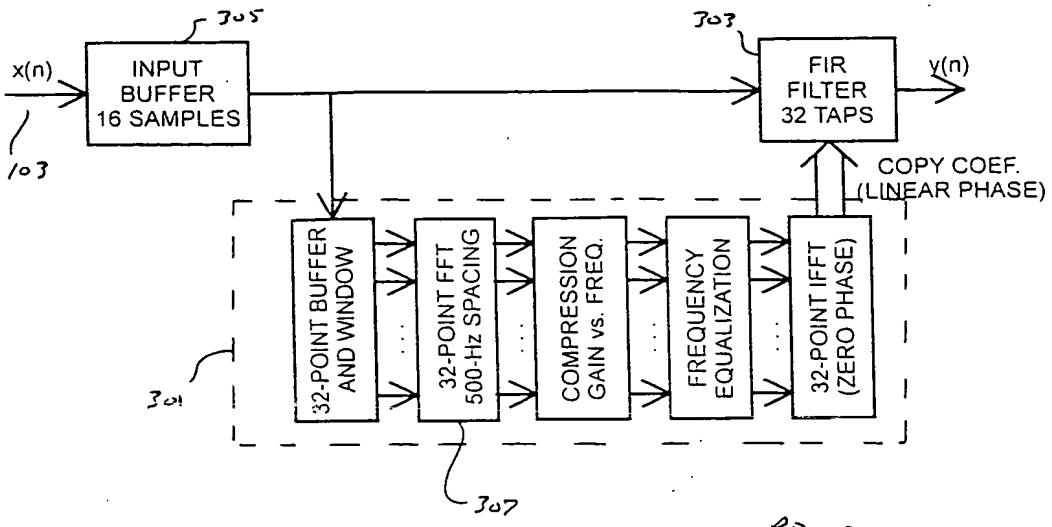


FIG. 2 PRIOR ART

Express Mail Label No. EL828015395US



PRIOR ART

FIG. 3

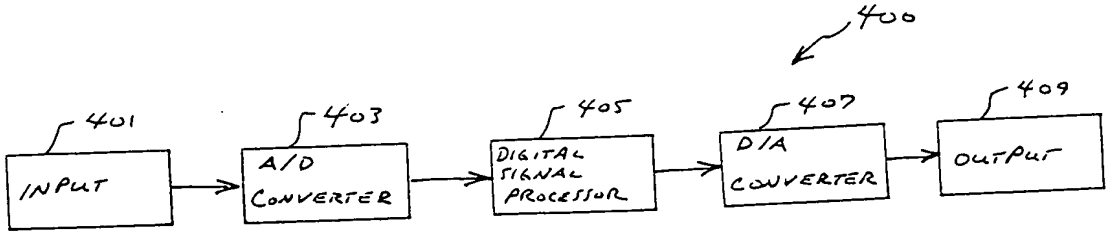


FIG. 4

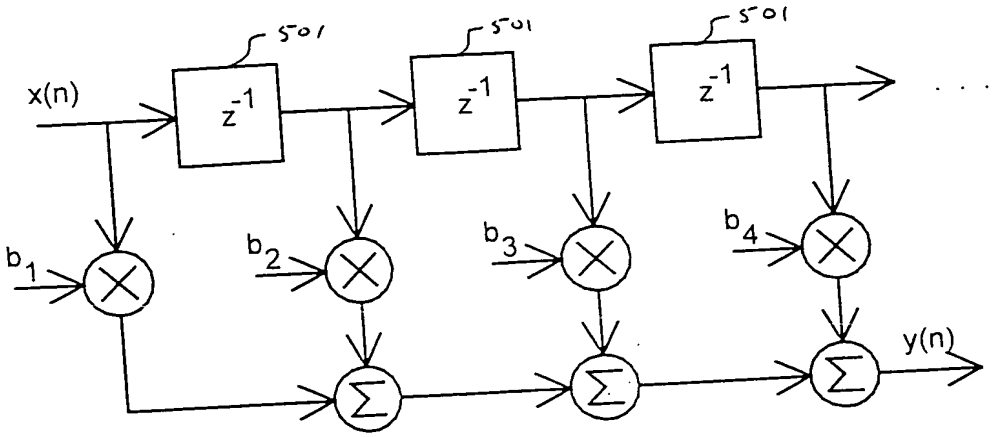

501
501
501
x(n)
z^{-1}
z^{-1}
z^{-1}
b_1
b_2
b_3
b_4
y(n)

FIG. 5

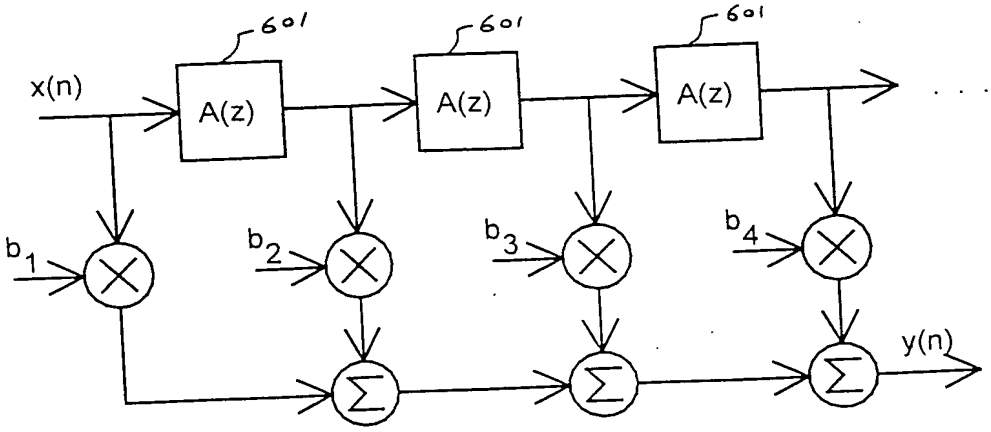

601
601
601
x(n)
A(z)
A(z)
A(z)
b_1
b_2
b_3
b_4
y(n)

FIG. 6

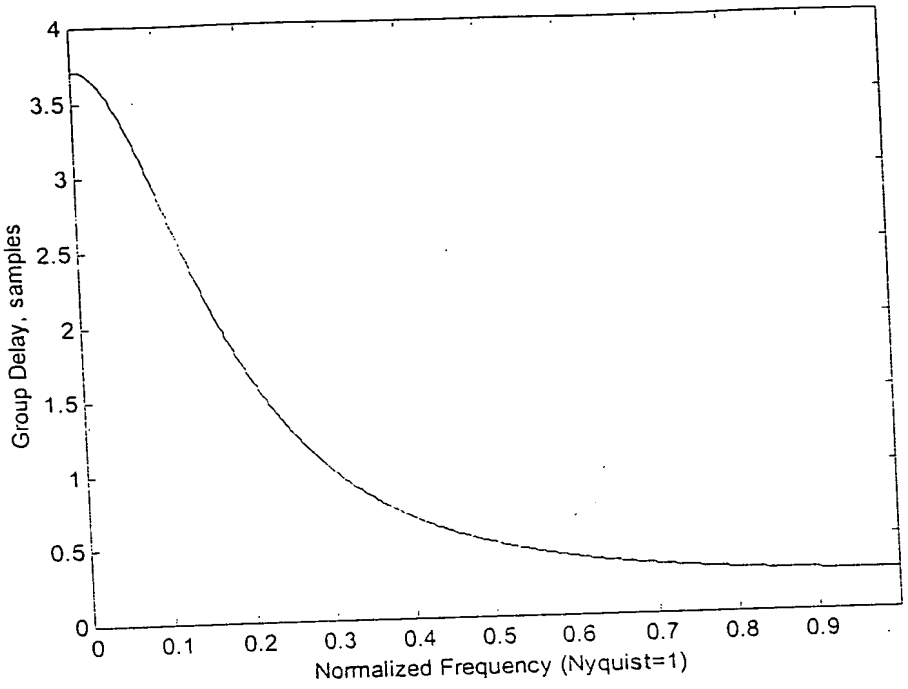

Group Delay, samples
Normalized Frequency (Nyquist=1)
0
0.5
1
1.5
2
2.5
3
3.5
4
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

FIG. 7

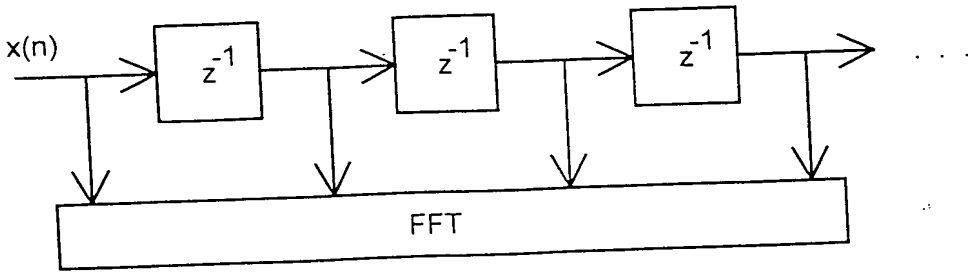

x(n)
z-1
z-1
z-1
FFT

FIG. 8

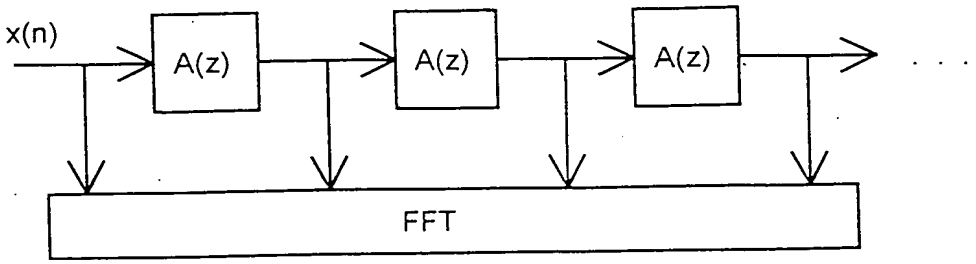

x(n)
A(z)
A(z)
A(z)
FFT

FIG. 9

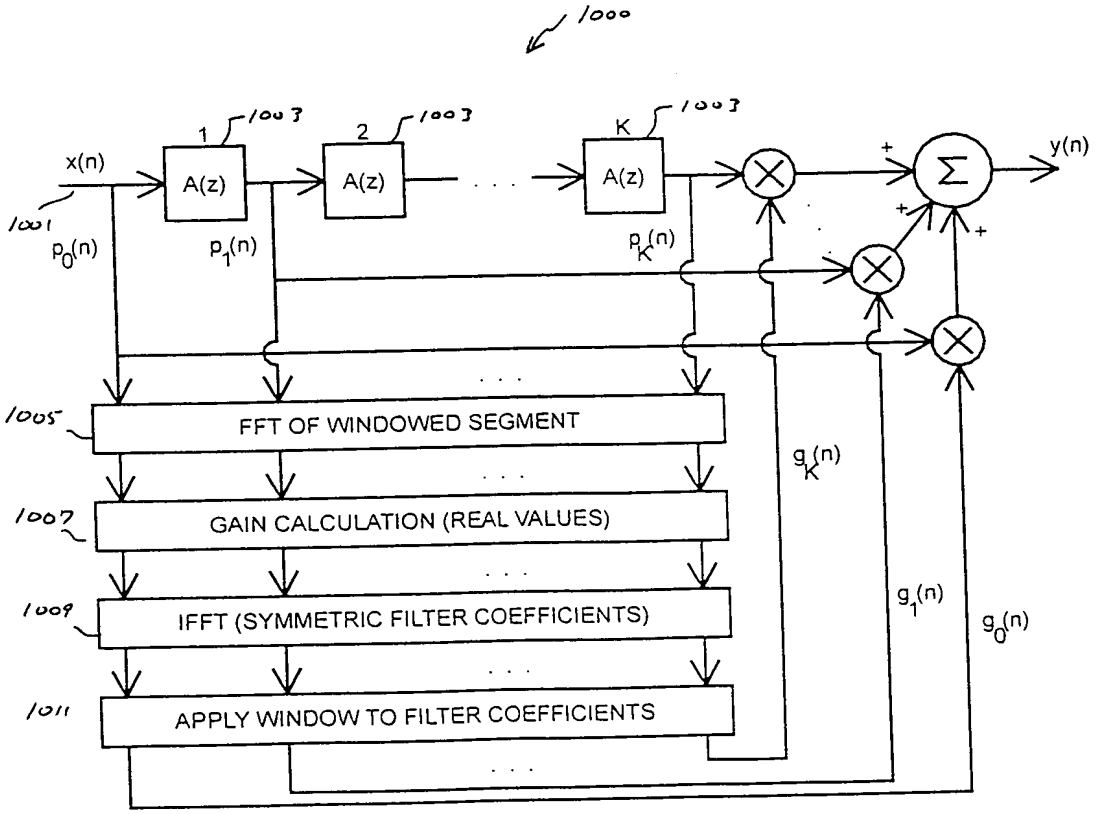

1000
1003
1003
1003
1
2
K
x(n)
A(z)
A(z)
A(z)
y(n)
1001
$p_0(n)$
$p_1(n)$
$p_K(n)$
1005
FFT OF WINDOWED SEGMENT
1007
GAIN CALCULATION (REAL VALUES)
1009
IFFT (SYMMETRIC FILTER COEFFICIENTS)
1011
APPLY WINDOW TO FILTER COEFFICIENTS
$g_K(n)$
$g_1(n)$
$g_0(n)$

FIG. 10

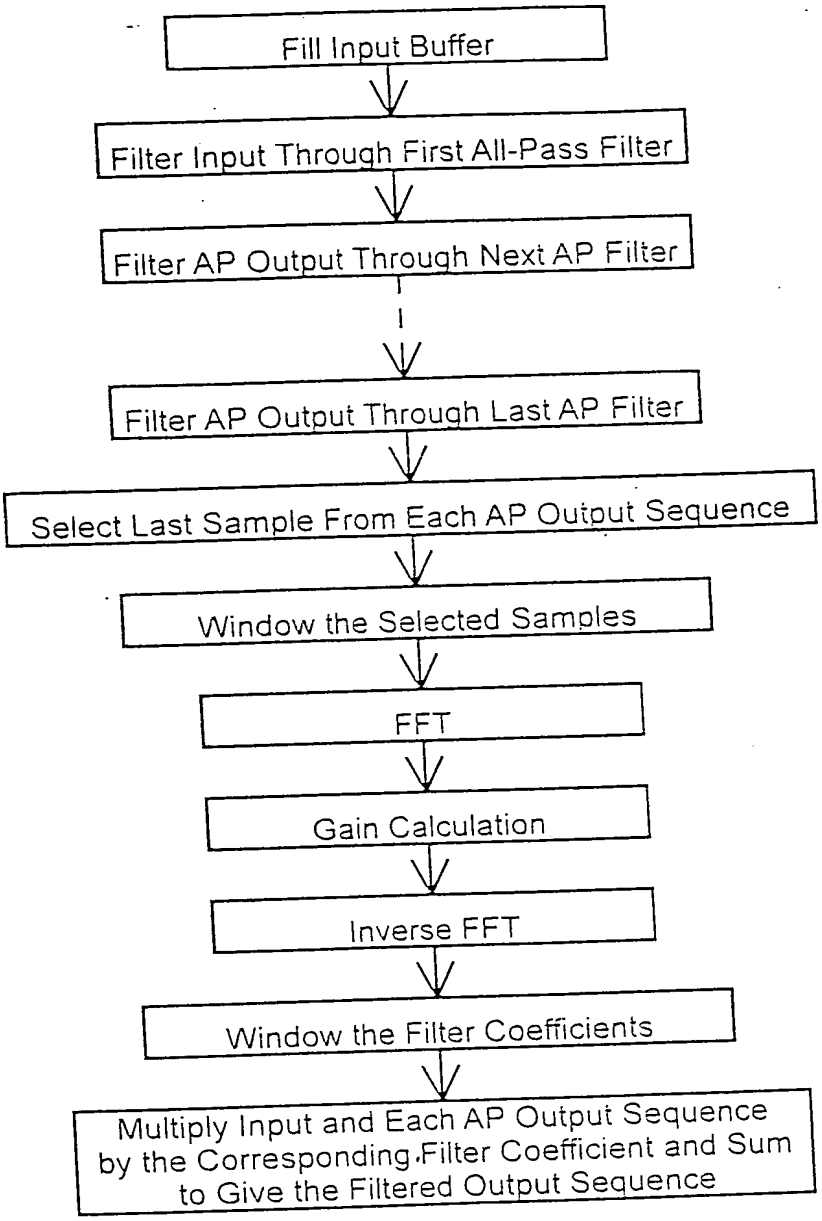

Fill Input Buffer
Filter Input Through First All-Pass Filter
Filter AP Output Through Next AP Filter
Filter AP Output Through Last AP Filter
Select Last Sample From Each AP Output Sequence
Window the Selected Samples
FFT
Gain Calculation
Inverse FFT
Window the Filter Coefficients
Multiply Input and Each AP Output Sequence by the Corresponding Filter Coefficient and Sum to Give the Filtered Output Sequence

FIG. 11

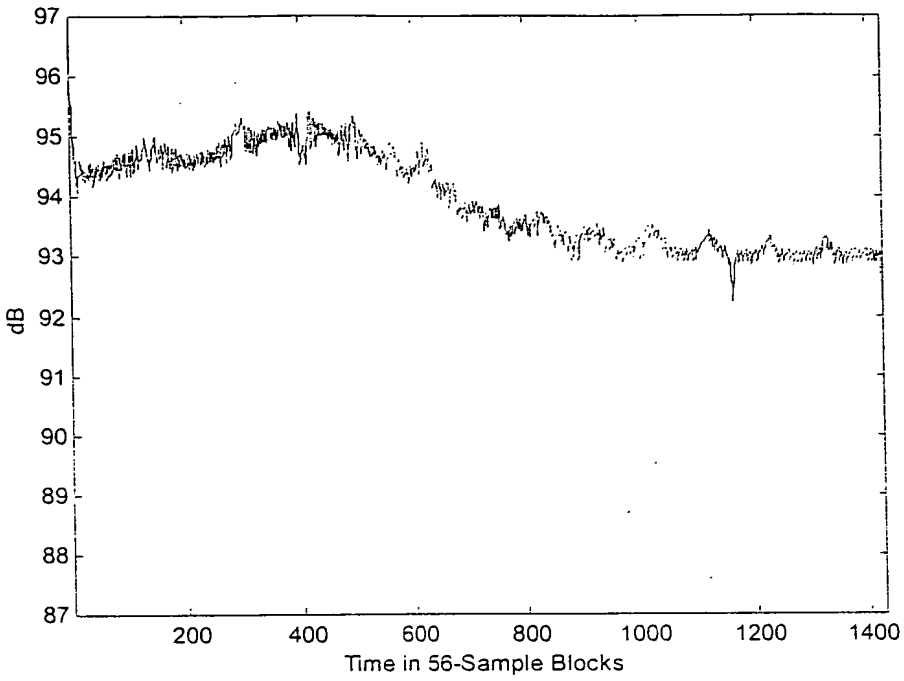

97
96
95
94
93
92
91
90
89
88
87
dB
200
400
600
800
1000
1200
1400
Time in 56-Sample Blocks

FIG. 12

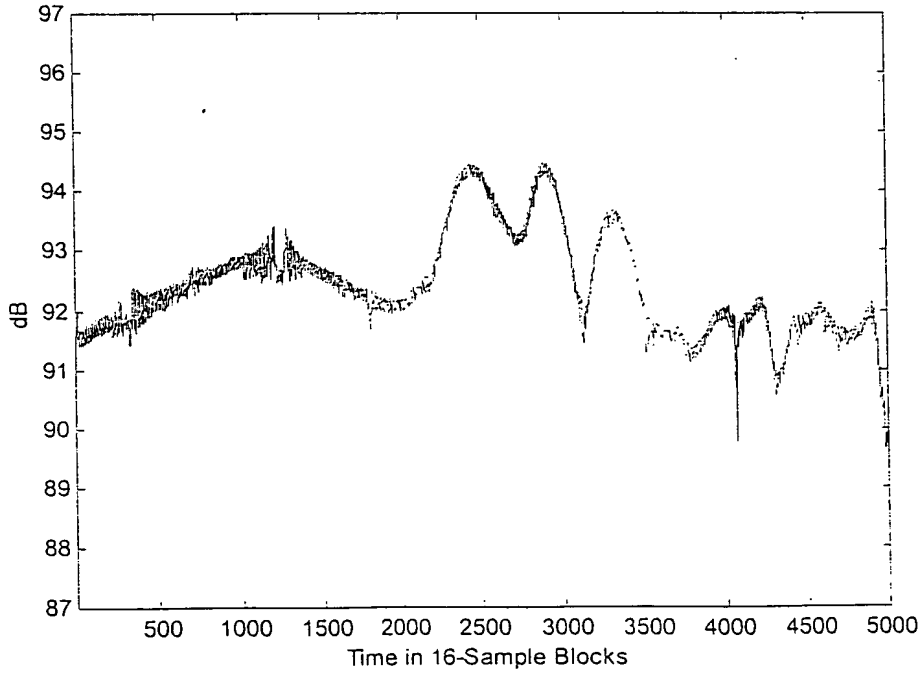

97
96
95
94
93
92
91
90
89
88
87
dB
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Time in 16-Sample Blocks

FIG. 13

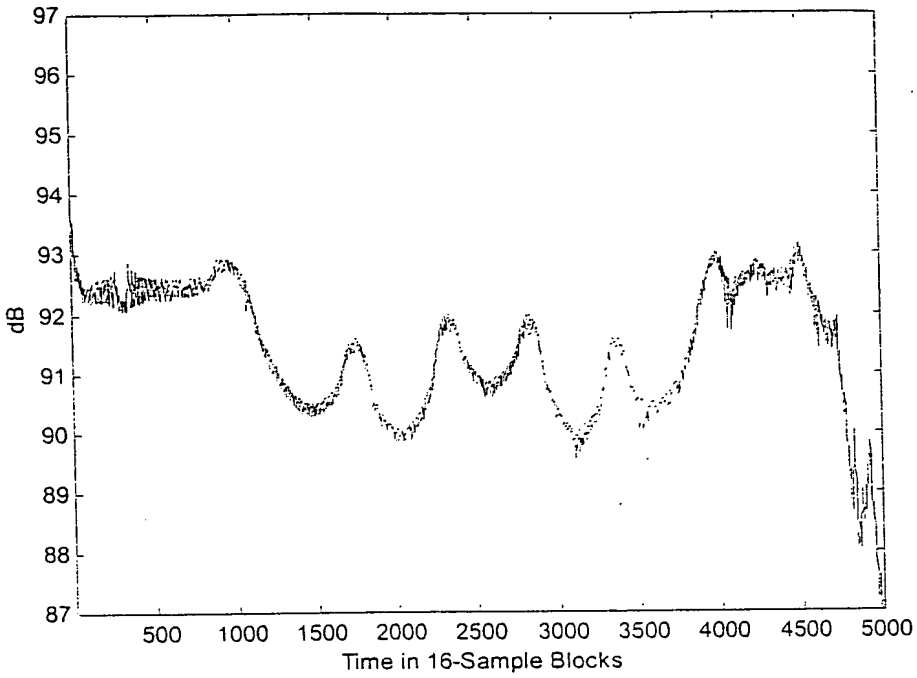


FIG. 14

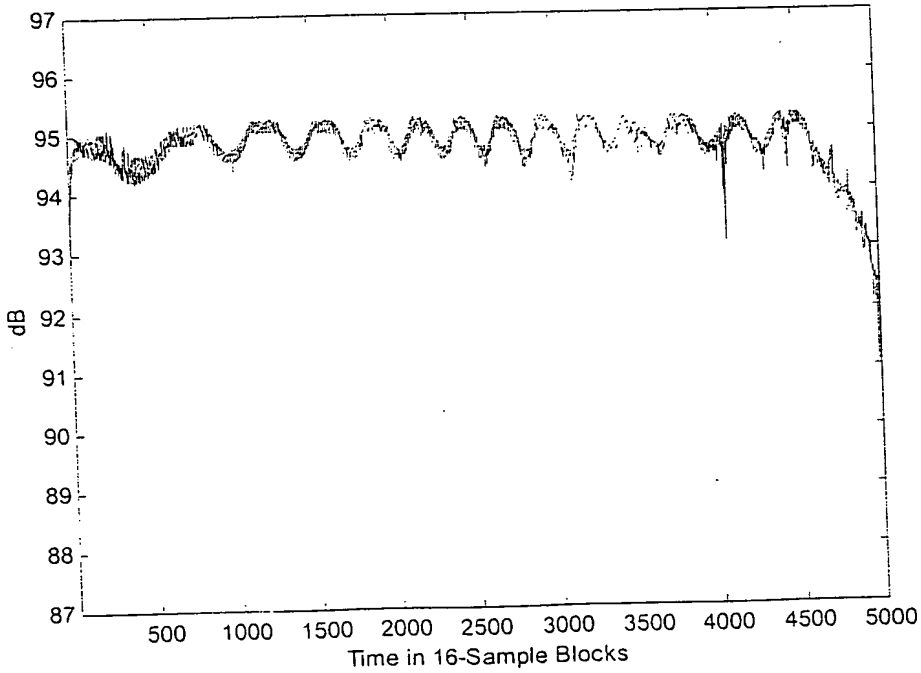


FIG. 15

EXPRESS MAIL NO. EL828015395US

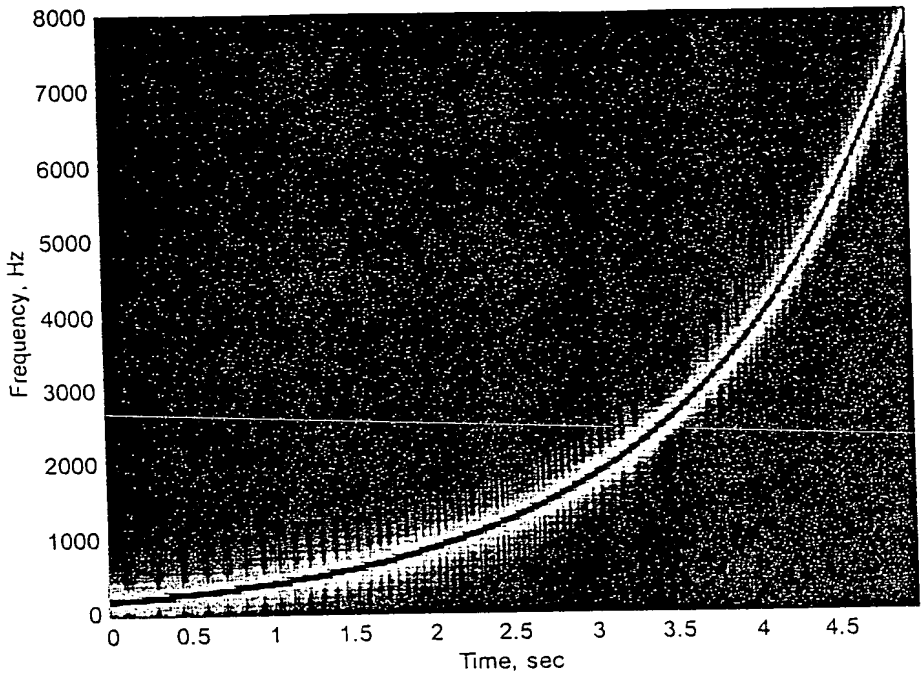

8000
7000
6000
5000
4000
3000
2000
1000
0
Frequency, Hz
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Time, sec

FIG. 16

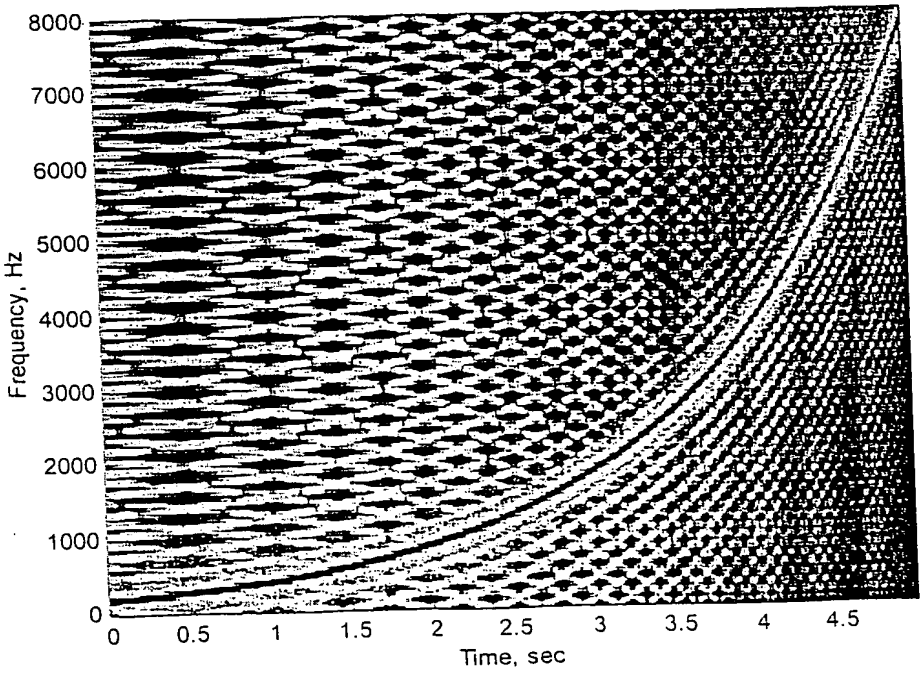

8000
7000
6000
5000
4000
3000
2000
1000
0
Frequency, Hz
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Time, sec

FIG. 17

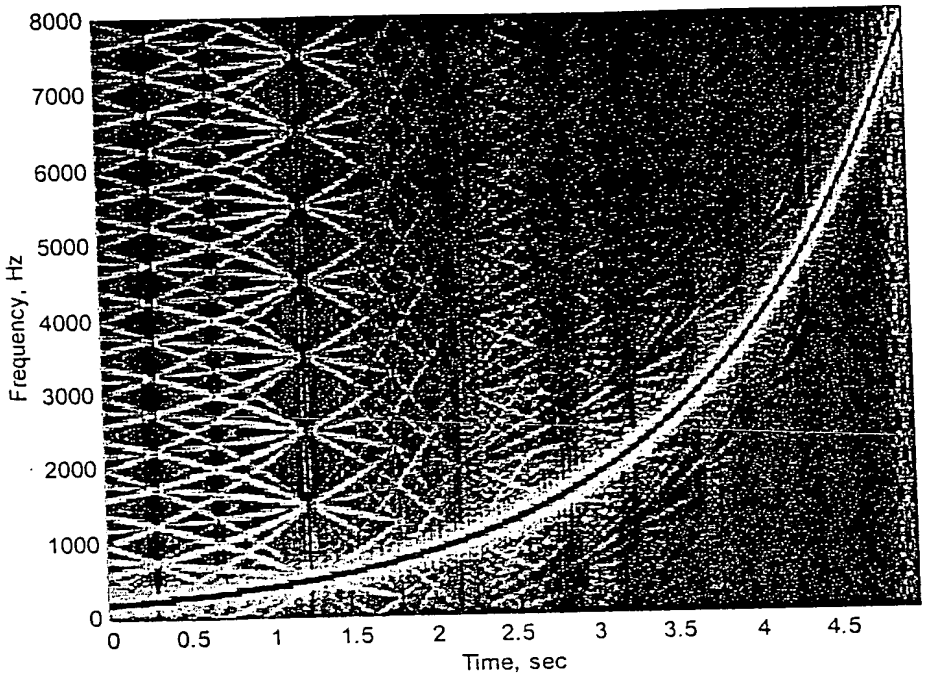


FIG. 18

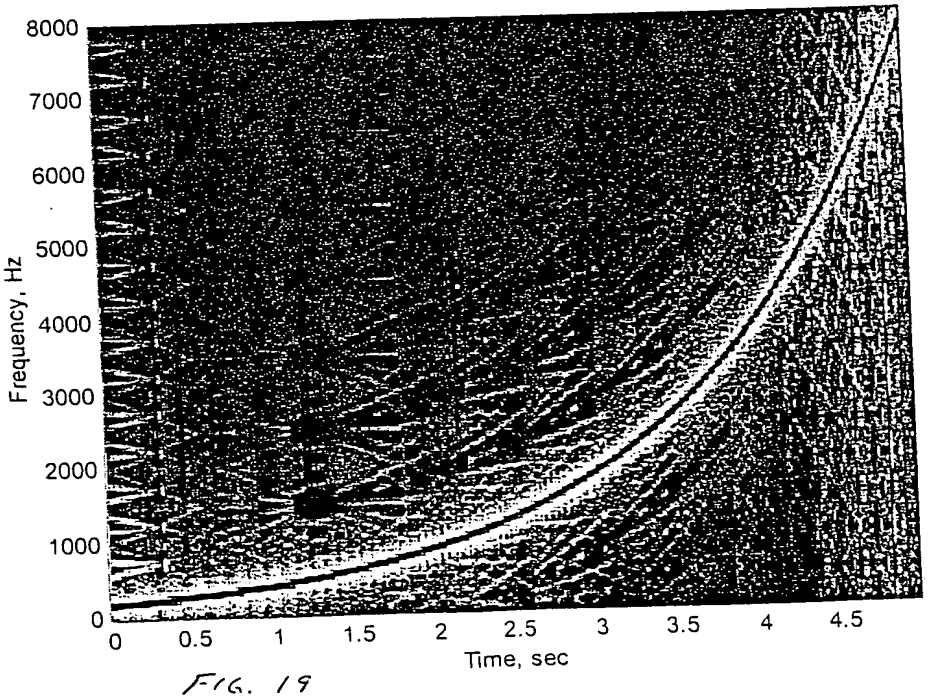


FIG. 19

09614 = 09505 = 09505

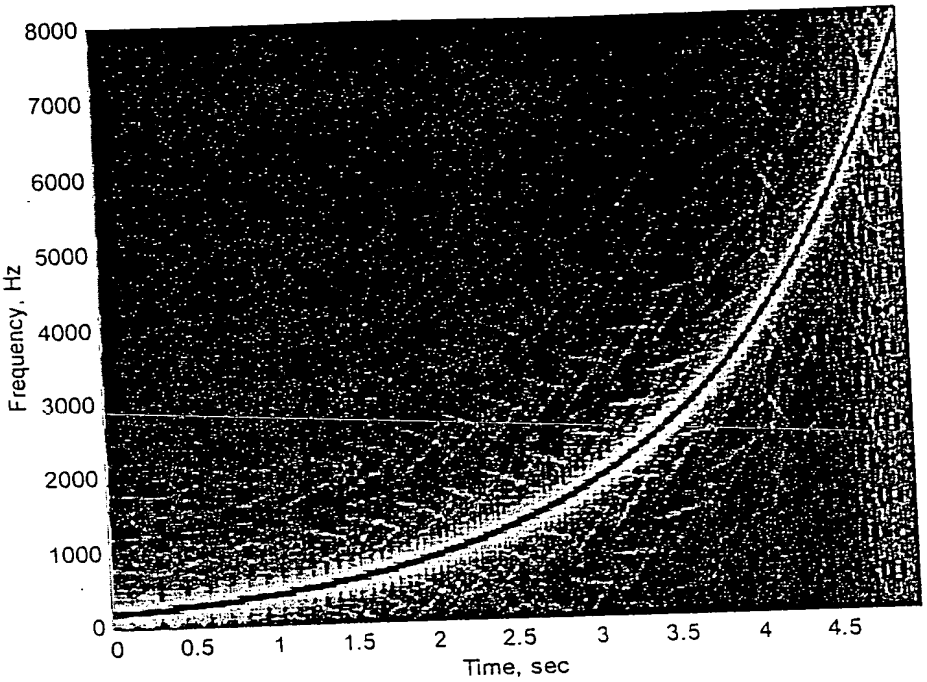

8000
7000
6000
5000
4000
3000
2000
1000
0
Frequency, Hz
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Time, sec

FIG. 20